

## OPTICAL SUBSTANCE ANALYZER

### ABSTRACT OF THE DISCLOSURE

A portable waveguide sensor having one or more gratings. In one embodiment, 5 the sensor has a waveguide, wherein a plurality of grooves imprinted onto the waveguide form a Bragg grating. The surface of the grooves has a functional layer adapted to bind a substance of interest, e.g., a biological pathogen. When the pathogen binds to the functional layer, the binding shifts the spectral reflection band corresponding to the Bragg grating such that a probe light previously reflected by the grating now passes through the 10 grating, thereby indicating the presence of the pathogen. In another embodiment, the sensor has a Mach-Zehnder interferometer (MZI), one arm of which has a resonator formed by two Bragg gratings. The surface of the resonator between the gratings has a functional layer whereas the Bragg gratings themselves do not have such a layer. Due to multiple reflections within the resonator, light coupled into the MZI interacts with the 15 bound pathogen over a relatively large effective propagation length, which results in a relatively large differential phase shift and therefore advantageously high sensitivity to the pathogen.